

Remarks:

Claims 1-4 were rejected under 35 USC 112 on the ground that it is unclear whether "Si+Al" is directed to the sum of the weight percent of the two components in the steel. The Office Action notes that it appears that such is directed toward the sum of the weight percentage and therefore the prior art was applied in this manner. The Examiner is correct. Claim 1 is amended to note that "each of Si and Al is a content by mass contained in the steel sheet" ("content by mass" corresponds "content by weight"). Claim 2 has been amended in a corresponding manner. It is respectfully submitted that workers in this field, based on the disclosure of the specification and drawings, would know that the designation is in terms of percent by weight (mass).

Claims 1-4 are rejected under 35 USC 102 as being anticipated by the Takada et al US 6,517,995 (hereinafter "Takada"). Claims 1-4 are also rejected under 35 USC 103 as being directed to subject matter which is obvious over JP 2002-038248 (hereinafter "JP '248") in view of JP 11-131145 (hereinafter "JP '145"). Before discussing the rejections, applicants' claimed method is restated to place it in the context of the art.

High tensile strength galvanized steel sheet is increasingly desired by industry to permit use of thinner sheets thereby lowering the weight of the load. However, increases in tensile strength tend to correlate with decreased ductility and/or workability. Galvanized steel sheet is prepared by a hot-dip method and then applying an alloying treatment to the hot-dip galvanized steel sheet. It has been found that the alloy treatment may lower the tensile strength and/or ductility of the steel sheet relative to a steel sheet which has not been subjected to the alloying treatment.

Applicants' claimed invention provides a galvanized steel sheet which has been subjected to an alloying treatment without a variation of the tensile strength larger than 2 kgf/mm² and a variation in the elongation not larger than 2 percent relative to the steel sheet which has not been subjected to the alloying treatment. This feature has been added at the end of claims 1 and 2 by the present Amendment. This amendment of the claims is supported by the disclosure on page 18 of the specification and in Figs. 2 and 3. Applicants' claimed invention accomplishes the foregoing by controlling the time and temperature of the alloying treatment to meet the formula set forth for Si and Al in claim 1 (and for Si, Al, Cr, Mo and V in claim 2) to provide a galvanized steel sheet in which the difference in mechanical

properties from those of the same steel sheet without alloying treatment provides a delta tensile strength not larger than 2 kgf/mm² and a delta elongation not larger than 2%.

Broadly speaking, applicants' claimed invention achieves the desirable features of decreasing variations in the mechanical properties (including maintaining good tensile strength and good elongation properties) by limiting the amounts of Si and Al (and for claim 2, also the other noted elements) and controlling time and temperature of the alloying treatment in accordance with the formulas set forth in claim 1 (and claim 2). The discovery of the microstructure mechanism which results from carrying out applicants' process is the basis of applicants' invention. This is described as follows in the present specification, page 21, first paragraph:

"For the case that the alloying heat treatment conditions are high temperature and long time, the related art focused on the suppression of precipitation of pearlite from the secondary phase. However, it was found that sole suppression of pearlite precipitation is not sufficient to prevent the deterioration of mechanical properties during the alloying treatment and that the precipitation of fine carbide in the secondary phase significantly affects the variations of mechanical properties. A presumable reason of the phenomenon is the following. When the martensite transformation occurs in cooling step, the precipitation of carbide from the secondary phase, the quantity, configuration, and distribution of the carbide vary the hardness of the secondary phase, and further, when the secondary phase remains as retained austenite, the precipitation of carbide decreases the

amount of residual secondary phase and deteriorates the stability thereof, thus increasing the amount of martensite, thereby varying the mechanical properties."

With reference to the \$102 rejection based upon Takada, Takada does not disclose controlling time and temperature of the alloying treatment in accordance with the formula set forth in applicants' claim 1 or claim 2 to provide an alloy galvanized steel sheet having the mechanical characteristics discussed in the preceding sentence. With reference to the \$103 rejection, JP '145 does not disclose controlling time and temperature as discussed in the preceding sentences to produce the desired product. This deficiency in JP '145 is not furnished by the disclosure of JP '248 which discloses phosphorus in a steel but is otherwise not applicable to applicants' claimed invention.

Takada discloses improving plating adhesion by suppressing, by the operation of Ni in the surface layer after adding Ni together with Si and Al, the concentration of Si and Al in the surface. Further JP '248 and JP '145 are inventions of utilizing the effects, by Si, of the suppression of precipitation of pearlite from γ . That is to say, the prior art are directed to suppress the occurrence of lowering of elongation caused by lowering of the residual γ fraction, resulting from the precipitation of pearlite from γ during


cooling after annealing. And these are methods, at the same time, of improving the plating adhesion property by replacing, with Al, a portion of Si which disturbs plating adhesion property. All of Takada, JP '248 and JP '145 are not inventions of taking into consideration the variations in the mechanical properties which is the principal object of the present application and there are no disclosures concerning the evaluations of the variations in the mechanical properties of the Examples in the cited references. The invention of the present application is made on the basis of new knowledge.

The rejection based upon a combination of JP '145 and JP '248 is further traversed on the ground that there are no teachings in these references to select these two references from the voluminous prior art and then combine in the manner relied upon in the rejection and then further modified the thus combined disclosures to arrive at applicants' claimed invention.

It is respectfully submitted that applicants' claimed invention would not be obvious to a worker in this field based upon the disclosures of the cited references. It is further noted that applicants' claimed invention provides an advantageous result which is not disclosed in the cited references.

Reconsideration is requested. Allowance is solicited.

Respectfully submitted,


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